

### Abstract of the Invention

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

A method of creating a highly conductive transparent layer on a substrate without  
subjecting the substrate to high temperatures is disclosed. Pulsed laser energy of a wavelength and  
5 energy fluence within a selected range is used to crystallize a selected amorphous material using a  
low number of pulses (optimally as few as one) to form highly electrically conductive thin films  
that are optically transparent at visible wavelengths. This method does not subject the substrate to  
sustained higher temperatures and accordingly is particularly suitable for making transparent  
conductive thin film structures on substrates such as plastic that do not tolerate sustained higher  
processing temperatures. The disclosed method may also be useful in manufacturing processes in  
which the substrate is composed of a material (such as glass, for example) that is itself heat  
tolerant, but in which at the time of creation of the conductive layer is a part of a structure  
containing a material that does not withstand high temperatures, such as a low temperature plastic  
or other polymer. A thermal barrier comprised of an oxide, nitride or polymer material may be  
deposited on the substrate before the precursor material to help insulate the substrate from the  
thermal effects of the energy directed at the precursor material.